

MONITORING PLAN
PROJECT NO. BA-19
BARATARIA BAY WATERWAY RESTORATION

ORIGINAL DATE: June 6, 1995
REVISED DATE: July 23, 1998

Preface

Pursuant to a CWPPRA Task Force decision on April 14, 1998, the original monitoring plan was reduced in scope due to budgetary constraints. Specifically, only one post-construction aerial photography flight will be conducted, rather than three.

Project Description

The Barataria Bay Waterway Restoration project (BA-19), a beneficial use of dredged material project, will take place on Queen Bess Island, located approximately 1 mi (1.6 km) east of the Barataria Bay Waterway (BBW) at mile 3, within the southeastern portion of Barataria Bay (figure 1). Queen Bess Island has experienced significant erosion over the last 100 years. The island was reduced from 45 ac (18.2 ha) in 1956 to 22 ac (8.9 ha) in 1989 (Raynie and Sutton 1992).

In October 1990, an 1,800 ft (5,486 m) retainment dike was constructed on the western side of Queen Bess Island as part of phase 1 of the Queen Bess Island State Restoration Project (BA-05b). This earthen-shell dike linked the northern and southern tips of the island, creating an 8 ac (3.2 ha) dredged material disposal site. Approximately 75,000 yds³ (57,345 m³) of material were removed from a 2 mi (3.2 km) segment of the BBW and placed in the shallow-water disposal area at the western edge of the island. This area was filled to an initial height of +3.22 ft (0.98 m) NGVD (+4.0 ft MLG). To increase the elevation of the island, a breach was made in the shore dike through which effluent from the 8-ac disposal site was routed to the interior marsh. In June 1991 *Myrica cerifera* (wax myrtle), *Avicennia germinans* (black mangrove), *Baccharis halimifolia* (baccharis), *Lycium carolinianum* (matrimony vine), and *Iva frutescens* (marsh elder) were planted on the island and in the disposal area (for planting scheme and vegetation monitoring results, see Raynie and Sutton 1992). In July 1991, Louisiana Department of Natural Resources, Coastal Restoration Division (LDNR/CRD) personnel noted that *Spartina alterniflora* (smooth cordgrass) was beginning to naturally spread from the island into the disposal site. It was determined that the cordgrass covered 30% of the northern third, 15% of the middle third, and 40% of the southern third of the spoil area (LDNR/CRD 1992). In October 1992 phase 2 of the Queen Bess Island State Restoration Project (BA-05b) was completed. This phase of BA-05b placed riprap and crushed limestone around the entire perimeter of the island.

The Barataria Bay Waterway Restoration project will involve the beneficial use of dredged material for the creation of an additional 9 ac (3.6 ha) of wetland. This project will be similar to BA-05b in that it will utilize dredged material removed during routine maintenance of the BBW to enlarge

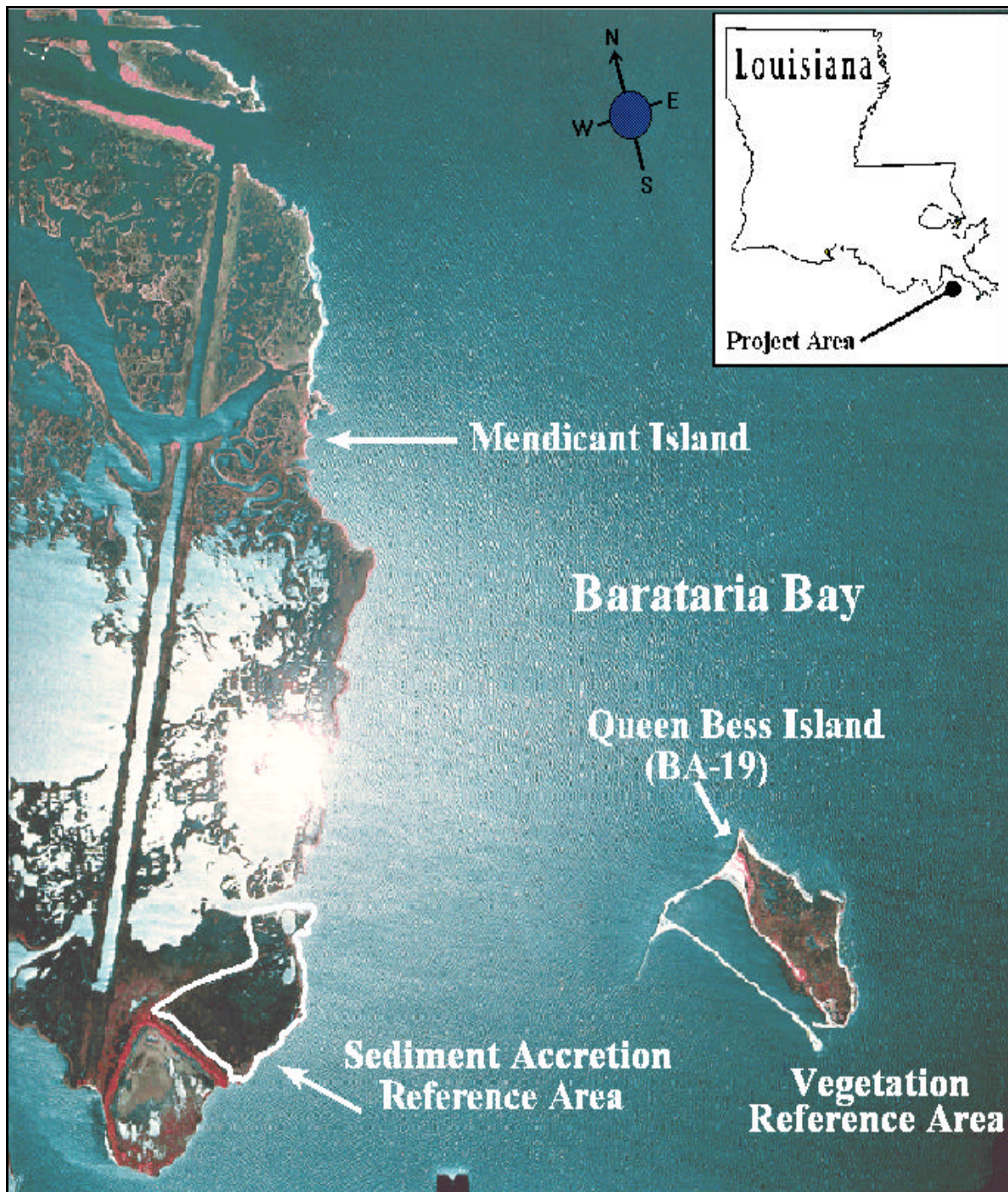


Figure 1. Location of the Barataria Bay Waterway Restoration (BA-19) project and reference areas (1995).

Queen Bess Island. Dredged material will be pumped into a 9 ac (3.6 ha) disposal area on the western side of the island. Effluent will be routed through the 8 ac (3.2 ha) wetland created in 1990, as well as the wetland on Queen Bess Island. Effluent exiting Queen Bess Island will be trapped in silt screens to prevent impacts to adjacent oyster reefs. A 1,650 ft (503 m) aggregate shell dike will be constructed to an elevation of +5.22 ft (1.6 m) NGVD (+6.0 ft MLG) to contain the dredged material. Dredged material will be pumped to an initial elevation of approximately +3.72 ft (1.13 m) NGVD (+4.5 ft MLG). Following 2 growing seasons of consolidation, the disposal area is predicted to have a final elevation of approximately +1.22 ft (0.37 m) NGVD (+2.0 ft MLG). Dike construction and disposal operations will be performed between August 1 and October 31, 1995, to avoid the nesting season of endangered brown pelicans (*Pelicanus occidentalis*) that use the island as a nesting area. During the period from November through July no work will take place on the island.

Monitoring of population and nesting site availability for the brown pelicans on Queen Bess Island is handled by the Louisiana Department of Wildlife and Fisheries (LDWF), through the Grand Terre Research Station. This project involves the beneficial use of dredged material to create vegetated wetlands, slow the erosion of a barrier island, and increase the elevation of existing wetlands. Project components are as follows (figure 2):

- ! Construction of a 1,650-ft (503 m) shell retainment dike
- ! Construction of a shore dike along the NW bank for protection of the colonial waterbird population
- ! Construction of a shore dike along the south bank and reshaping of the existing limestone retention dike
- ! Discharge of dredged material to an initial elevation of +3.72 ft (1.13 m) NGVD (+4.5 ft MLG) within the 9 ac (3.6 ha) disposal site
- ! Channel the effluent from the dredged material through the adjacent disposal area and the wetland on Queen Bess Island

Project Objectives

1. Create vegetated wetland using sediment from maintenance dredging of the Barataria Bay Waterway.
2. Benefit wetlands adjacent to the disposal area.

Specific Goals

The following measurable goals were established to evaluate project effectiveness:

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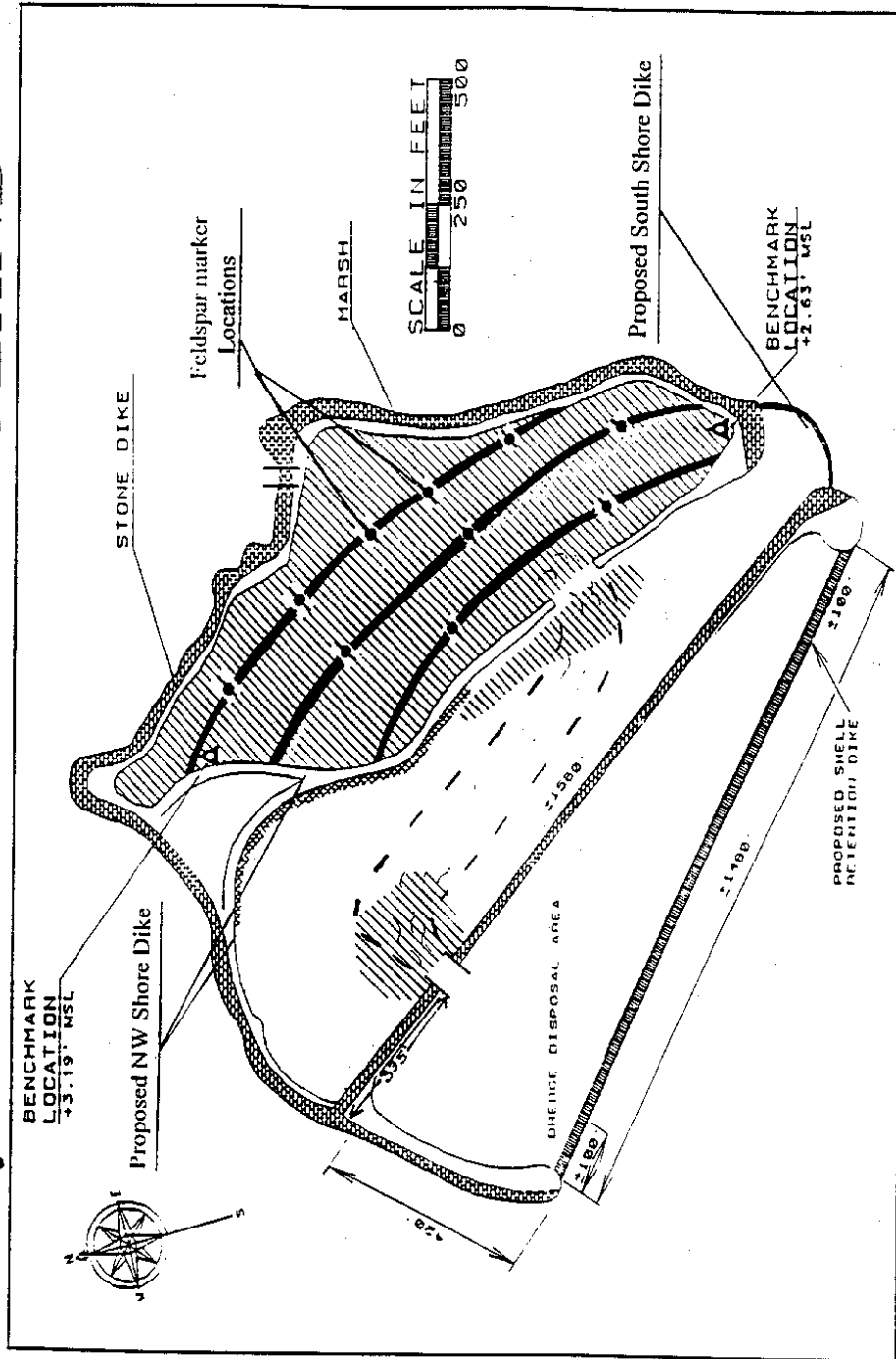


Figure 2. Project components and proposed movement of effluent

1. Creation of 9 ac (3.6 ha) of vegetated wetland by placement of dredged material within an aggregate dike; dredged material will be placed at an elevation no greater than +4.5 ft (1.4 m) MLG.
2. Use effluent of dredged disposal area to increase mineral sediment elevation in the broken marsh of Queen Bess Island.

Reference Area

The reference area has been chosen to compare sediment accretion in the existing marsh of Queen Bess Island to that of a neighboring barrier island. The evaluation of sites was based on the criteria that both project and reference areas have a similar vegetative community, soil type, and hydrology. Mendicant Island, located southwest of Queen Bess Island in Barataria Bay, was chosen because it satisfies this criteria. The natural marsh of Queen Bess Island and the southeast portion of Mendicant Island have scatlike muck soils (U.S. Soil Conservation Service 1983) where analogous wetland vegetation is established.

Due to its location in Barataria Bay, Mendicant Island appears to be susceptible to tidal and storm surge overwashing as occurs on Queen Bess Island. The reference area on Mendicant Island also contains shallow-water ponds similar to Queen Bess Island.

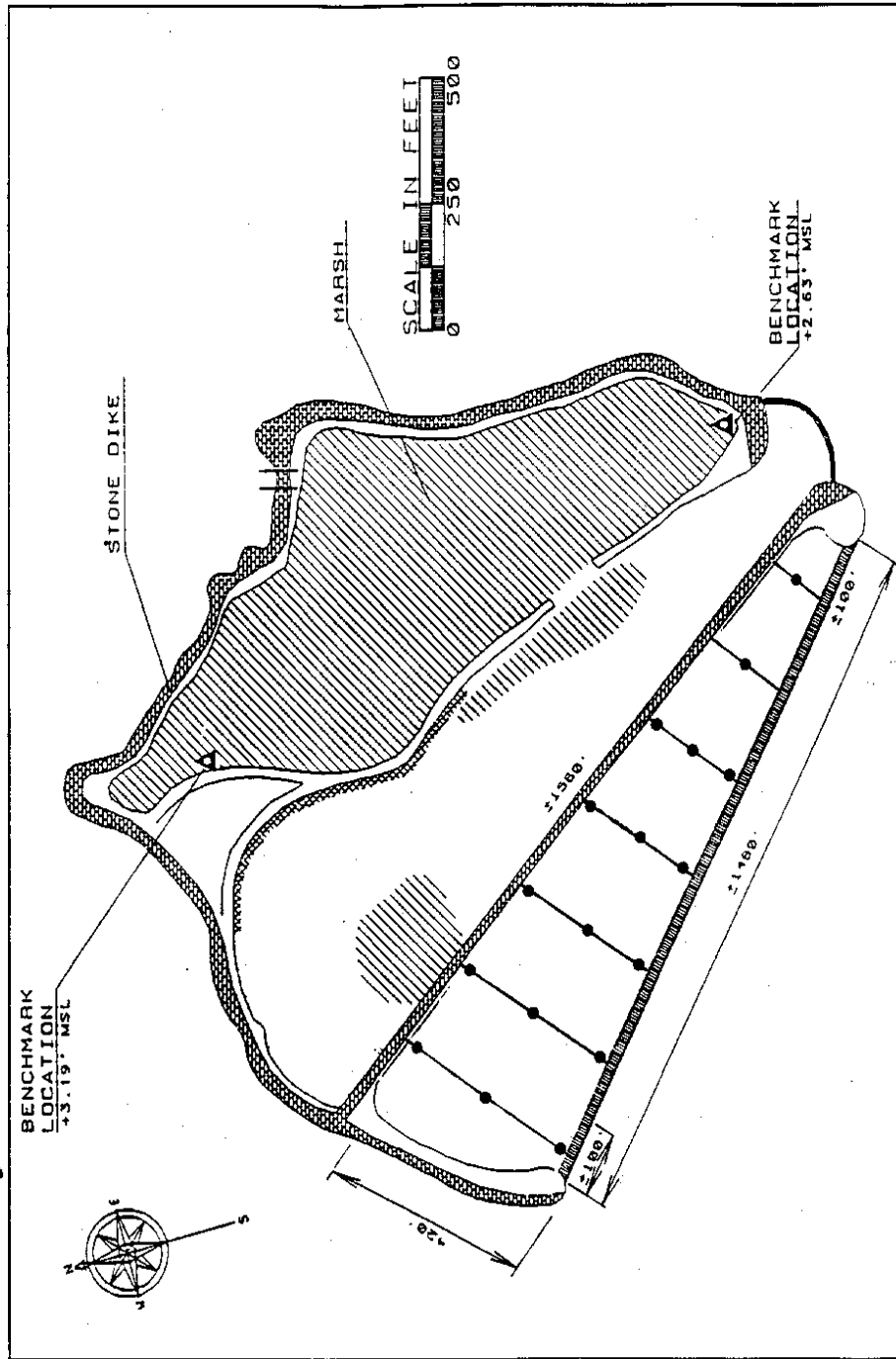
The proposed reference area will be used in the evaluation of sediment accretion within the marsh of Queen Bess Island. An equal proportion of feldspar plots will be designated in both the Queen Bess Island marsh and the marsh of Mendicant Island.

Monitoring Elements

The following monitoring elements will provide the information necessary to evaluate the specific goals listed above:

1. **Aerial Photography** To document vegetated and non-vegetated areas, color infrared aerial photography (1:12,000 scale with ground controls) will be obtained. The photography will be georectified using National Wetland Research Center (NWRC) standard operating procedures described in Steyer et al. (1995), but detailed photointerpretation, mapping and GIS is not currently planned. Photography will be obtained in 1994 (pre-construction) and in 2014 post-construction.
2. **Vegetation** A total of 7 northeast-to-southwest transects will be delineated every 200 ft (61 m) between the rock berm created during the 1990 Queen Bess Island project, across the disposal area to the newly created dike (figure 3). Cover and species composition will be estimated by two

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individuals for a 1 m wide track along each transect line. Vegetation transects will be sampled post-construction in 1996, 1997, 1998, 2005, and 2014.

3. Elevation Disposal site elevations will be estimated using six sediment staff gauges placed in the disposal containment area. These gauges will be used to evaluate the settlement of the dredged material over time. In addition, the elevation in the disposal site will be determined (ft NGVD) and related to average marsh elevation in the adjacent natural wetland. Average marsh elevation of the natural wetland is defined as the average of 20 random points within the *Spartina alterniflora* marsh, as determined by professional surveyors. Elevation surveys will be performed both pre-and postconstruction in 1996, 1998, 2005, and 2014, provided sediment consolidation is sufficient to allow traversing of the disposal area.
4. Sediment Accretion To document sediment accretion from the disposal effluent, which will be channeled to flow over the natural wetland, feldspar marker horizons will be used (Steyer et al. 1995). Stations will be located in the marsh, at the breach in the western shore dike, and at the effluent exit at the east side of the island. A total of 10 stations (0.5 m x 0.5 m) will be established in both the deposition and reference areas using systematic sampling based on topography (figure 2). In December 1997, after 1 year of settlement, a cryogenic corer will be used to sample the stations (Knaus and Cahoon 1990). Samples collected on Queen Bess Island will be compared to samples collected at the reference area.

Anticipated Statistical Tests and Hypotheses

The following hypotheses correspond with the monitoring elements and will be used to evaluate the accomplishment of the project goals.

1. Descriptive and summary statistics will be used on both historical data and data collected pre-project implementation to assess marsh loss/gain rates on Queen Bess Island.
2. The primary method of analysis will be to determine the percent cover of vegetation as evaluated by an analysis of variance (ANOVA) that will consider both spatial and temporal variation and interaction. Because of the difficulty with traversing the project area, data will be compiled by two or more investigators making ocular estimates of the relative abundance of vegetation. The average of these estimates will be taken as a single observation for each station. These data will be corrected before use in the ANOVA model. The data correction will be performed using a technique in which a reference area is used for the calibration of

visual judgements. Vegetation cover in the reference area will be determined by both visual judgement and by a more accurate method of determination using 1m² plots. A calibration will then be used to establish a regression relation between the two types of data. This regression model will be employed in the disposal area to extract reliable predicted values when less reliable observations are available. The ANOVA approach may include terms in the model to adjust for station/transect locations. Ancillary data (i.e., herbivory, historical) will be included as covariables when available. This additional information may be evaluated through analysis such as correlation, trend, multiple comparisons, and interval estimates.

Hypothesis:

H₀: Mean relative abundance of wetland vegetation within the disposal area at time j will not be significantly greater than mean relative abundance of vegetation at time i.

H_a: Mean relative abundance of wetland vegetation within the disposal area at time j will be significantly greater than the mean relative abundance of vegetation at time i.

If we fail to reject the null hypothesis, any possible negative effects will be investigated.

- 3, 4. The primary method of analysis will be to determine differences in elevation of mineral sediment as evaluated by an ANOVA. The ANOVA approach may include terms in the model to adjust for station locations. Historical data will be included as a covariable when available. This additional information may be evaluated through analysis such as: correlation, trend, multiple comparisons, and interval estimates.

Hypothesis:

H₀: Sediment accretion within the deposition area at year 1 will not be greater than sediment accretion in the reference area.

H_a: Sediment accretion within the deposition area will be greater than sediment accretion in the reference area.

NOTE: Available ecological data, both descriptive and quantitative, will be evaluated in concert with all of the above data and with statistical analyses to aid in determination of the overall project success. This includes ancillary data collected in this monitoring project but not used directly in statistical analyses, as well as data from other sources (USACE, USFWS, DNR, LSU, etc.).

Notes

1. Implementation: Start Construction: August 30, 1996
End Construction: November 11, 1996
2. USACE Point of Contact: Beth Cottone (504) 862-2778
3. DNR Project Manager: Joe Saxton (504) 342-6736
DNR Monitoring Manager: Dan Smith (504) 447-0990
DNR DAS Assistant: Chris Cretini (504) 342-0277
4. The twenty year monitoring plan development and implementation budget for this project is \$83,424. A progress report will be available in May 1997, and comprehensive reports will be available in November 1999, November 2006, and November 2016. These reports will describe the status and effectiveness of the project.
5. The project area was last flown for infrared aerial photography (1:12,000 scale) by Gulf Coast Aerial Mapping on December 1, 1993, for LDNR/CRD.
6. Queen Bess is 1 of 11 sites that will utilize dredged material for the creation of wetlands under project BA-19.
7. Average marsh elevation in the natural wetland will be established during each survey trip.
8. References:

Louisiana Department of Natural Resources, Coastal Restoration Division 1992. Queen Bess Island vegetative planting assessment. Baton Rouge: Louisiana Department of Natural Resources.

Knaus, R. M., and D. R. Cahoon 1990. Improved cryogenic coring device for measuring soil accretion and bulk density. *Journal of sedimentary Petrology* 60: 622-623.

Raynie, R. C., and B. Sutton 1992. Annual monitoring report for Queen Bess Island (BA-05b). Baton Rouge: Louisiana Department of Natural Resources, Coastal Restoration Division.

Steyer, G. D., R. C. Raynie, D. L. Steller, D. Fuller and E. Swenson 1995. Quality management plan for Coastal Wetland Planning, Protection, and Restoration Act monitoring program. Open-file report 95-01. Baton Rouge: Louisiana Department of Natural Resources, Coastal Restoration Division.

U.S. Soil Conservation Service 1983. Soil Survey of Jefferson Parish, Louisiana. 228 pp.
New Orleans, Louisiana: United States Department of Agriculture, Soil Conservation
Service.